

# Wideband Radio Frequency Interference Detection for Microwave Radiometer Subsystem

Completed Technology Project (2015 - 2018)



## Project Introduction

Anthropogenic Radio-Frequency Interference (RFI) is threatening the quality and utility of multi-frequency passive microwave radiometry. The GPM Microwave Imager (GMI) on the Global Precipitation Measurement (GPM) mission launched on February 27, 2014 is already seeing RFI in the 10.7 and 18.7 GHz channels. It is important to understand that these frequency bands are strictly protected for science data measurement; yet, it is still corrupted by RFI. Indeed, this issue has led to the development of the first spaceborne digital RFI mitigation radiometer operating at 1.4 GHz for the Soil Moisture Active and Passive (SMAP) mission. We leverage our experience on SMAP to develop innovative technology for wider-bandwidth higher-frequency radiometers. The objective of this proposal is to develop a wideband (200-1000 MHz) digital detector subsystem and to demonstrate innovative RFI detection and removal techniques for microwave radiometers. The techniques proposed, complex valued kurtosis detector and independent component analysis (ICA), have the potential to improve the RFI detection rate in high frequency bandwidth. We are responding to a national imperative to develop RFI mitigation technology for future spaceflight radiometers. "Spectrum Management for the Twenty-first Century" recommends the continued development of so-called non-cooperative mitigation technologies. The Earth Science Technology roadmap for Advanced Microwave Components and Systems seeks "Demonstration of RFI mitigation approaches, and algorithms for future RFI environments to 40 GHz and beyond." These two National Research Council reports emphasize the importance of RFI mitigation technology for sustaining a reliable national passive microwave remote sensing capability.

## Anticipated Benefits

SMAP



ALHAT - ETD Autonomous  
Landing & Hazard Avoidance  
Tech Earth Science Technology  
Office

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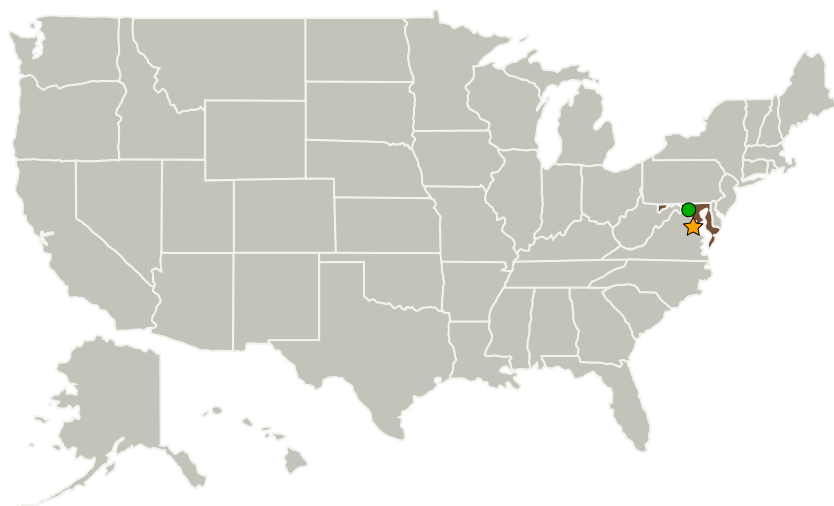
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## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work       | Role                    | Type  | Location                         |
|-------------------------------------|-------------------------|---|----------------------------------|
| ★ NASA Headquarters(HQ)             | Lead Organization       | NASA Center   | Washington, District of Columbia |
| ● Goddard Space Flight Center(GSFC) | Supporting Organization | NASA Center   | Greenbelt, Maryland              |
| Morgan State University             | Supporting Organization | Academia<br>Historically Black Colleges and Universities (HBCU) | Baltimore, Maryland              |

## Primary U.S. Work Locations

Maryland

## Organizational Responsibility

**Responsible Mission Directorate:**

Science Mission Directorate (SMD)

**Lead Center / Facility:**

NASA Headquarters (HQ)

**Responsible Program:**

Advanced Component Technology Program

## Project Management

**Program Director:**

Pamela S Millar

**Program Manager:**

Amber E Emory

**Principal Investigator:**

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Englin Wong

Damon C Bradley

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## Images

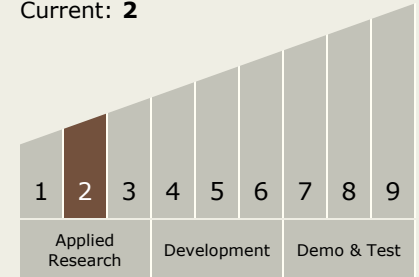


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ALHAT - ETD Autonomous Landing  
& Hazard Avoidance Tech Earth  
Science Technology Office  
(<https://techport.nasa.gov/image/5095>)

## Technology Maturity (TRL)

Start: 2  
Current: 2



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

## Target Destination

Earth